Geophysical Research Abstracts
Vol. 12, EGU2010-7227, 2010
EGU General Assembly 2010

Improved Regional Climate Change Projections Through Dynamical Downscaling

Stuart Corney (1), Jack Katzfey (2), John McGregor (2), Michael Grose (1), James Bennett (1,3), Christopher White (1), Greg Holz (1), Nathan Bindoff (1,2)

(1) Antarctic Climate & Ecosystems Cooperative Research Centre, University of Tasmania, Hobart, TAS, Australia , (2) Centre for Australian Climate and Weather Research, CSIRO Marine and Atmospheric Research, Aspendale, VIC, Australia, (3) Hydro Tasmania Consulting, Cambridge, TAS, Australia

The Climate Futures for Tasmania (CFT) project has undertaken a series of dynamical downscaling simulations using CSIRO's Conformal Cubic Atmospheric Model (CCAM). These simulations provide high resolution (10 km) output over the Australian state of Tasmania. The simulations use as boundary conditions output from six GCMs and two SRES emission scenarios, giving a total of twelve runs.

By modeling the atmosphere at a much finer scale than is possible using a coupled GCM we can more accurately capture the processes that operate on Tasmania's weather/climate at the regional level and thus can more clearly answer the question of how Tasmania's climate will change in the future. We present results that show the improvements in resolving the local-scale climate and climate drivers with increasing resolution that can be achieved through downscaling, when compared to a gridded observational data set (AWAP).

Changes in rainfall patterns are one of the key uncertainties surrounding climate change. The spatial pattern of rainfall in the 1961 to 1990 climate in the GCMs has no correlation with the observed rainfall climate over Tasmania, however the CFT downscaled simulations have a correlation of 0.69 with the observed annual rainfall over this period. For temperature the correlation between the CFT simulations and AWAP data is 0.99.

A feature of the projections is the increased summer and autumn rainfall along Tasmania's east coast, in contrast to the current (15 year) dry spell that has seen drying in the east and wetting in the west. This seasonal increase in rainfall is not present in global climate model projections, which all predict a decreasing rainfall trend across Tasmania.

We demonstrate that the increased rainfall over the east coast is due to a localised coupled ocean-atmosphere response. The high pressure belt moves southward and increases in strength, deflecting the dominant westerly winds further south. This wind increase spins up the South Pacific Gyre, causing the East Australian Current to extend southwards resulting in an anomaly of the mean sea level pressure that enhances the moisture flux over the east coast of Tasmania. This coupled ocean-atmosphere response for rainfall is an example of large scale climate change driving a local change in rainfall through increased frequency of low pressure systems over the Tasman Sea.